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## ALPINE VERTEBRATES OF MOUNT KENYA, WITH PARTICULAR NOTES ON THE ROCK HYRAX

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### INTRODUCTION

Various observers over the years have contributed to our knowledge of Mount Kenya's alpine vertebrates. There is only limited evidence that traditional cultures visited alpine Mount Kenya (Coe 1967), and no records of what they found there. Sharpe (1900) and Thomas (1900) made the first lists of animals on Mount Kenya, followed shortly by Loring and Heller (in Roosevelt 1910). Hollister (1919) provided a description of mammals collected from East Africa, including those of Mount Kenya.

However, it was not until Moreau (1944) that a systematic description of the vertebrate fauna was attempted. Since then, a great deal has been added to our understanding of the vertebrates of alpine Mount Kenya. Coe and Foster (1972) made a considerable contribution to our knowledge of the mammals of the northern slopes, in particular the smaller mammals (rodents and shrews). Williams (1978) provided an extensive list of birds and mammals of Mount Kenya National Park. Coe (1967), Coe and Sale (1971), Fayad (1981), and Young (1991) gave brief summaries of the alpine faunas of Mount Kenya and Kilimanjaro. Numerous other authors have provided information on individual species and groups. Mount Kenya has been the subject of considerable botanical, zoological, and ecological research over the last thirty years (see Rehker 1989, Young 1990). Nonetheless, it has been half a century since the last comprehensive description of Mount Kenya's alpine vertebrate fauna (Moreau 1944). It is therefore appropriate to update our knowledge of the alpine vertebrates of Mount Kenya.

In this review, we have drawn on published literature and on personal communications with both visitors and those familiar with the mountain. However, much of the information below is drawn from personal experience. Between 1977 and 1990, TPY spent over 500 days and nights above treeline on Mount Kenya. Most of this time was spent in the Teleki Valley, but also included one to several visits to

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each of the Hobley, Hinde, Gorgeš, Hohnel, Mackinder, Liki, Sirimon, Kazita, and Marania Valleys. In 1989–90, MRE spent over 200 days on Mount Kenya, mostly in the Teleki Valley.

In the descriptions below, the 'research camp' (of TPY) was located at 4180 m in the Teleki Valley, near the Ranger Station. 'Northern slopes' refers to the area above treeline between the Hinde and the Sirimon Valleys (mainly the drainages of the Marania and Kazita rivers). The 'Treeline' occurs at 3000–3300 m. Elevations are probably accurate to  $\pm 100$  m. Except where noted, all of the observations below are ours.

At least 15 of the 112 species listed below have not been previously recorded from alpine Mount Kenya. In addition, species previously thought to be only alpine visitors have been identified as at least partly resident in the alpine zone (e.g., Slender-billed Starling, Lion and Zorilla). There are also several new altitudinal limits for Africa (Spotted Hyaena, Zorilla, Bongo, Sykes' and Colobus Monkeys, Yellow-crowned Canary, and *Rana wittei*). We have accepted the nomenclature of specialised literature (reptiles and amphibians: Loveridge 1957; birds: Britton 1980, Lewis and Pomeroy 1989; mammals: Dorst and Dandelot 1972 and Kingdon 1974).

### ALPINE VEGETATION OF MOUNT KENYA

The Mount Kenya forest varies with aspect. It is wettest on the south-eastern slopes and driest on the northern slopes, with bamboo favoring the wettest sites (Hedberg 1951, Young 1990). However, at higher altitudes (above treeline), the western slope (Naro Moru track) and southern slope (Kamweti track) are wetter than either the northern slope (Sirimon and Timau tracks) or eastern slope (Chogoria track). In general, rainfall increases with altitude up to 2500–3200 m, and then decreases with altitude (Winiger 1986).

Numerous attempts have been made over the years to describe the vegetation of Mount Kenya (Hedberg 1951, 1964; Coe 1967), but only recently has an alpine vegetation map been produced (Rehder *et al.* 1988, 1989) and a quantitative analysis of plant community composition done (Young and Peacock 1992). Common to all descriptions is the recognition of the importance of altitude and topography on the alpine vegetation. A well defined timberline occurs at 3000–3300 m on all but the northern slopes. (On the northern slopes we have arbitrarily set 3000 m as the lower limit for alpine records). Many plant species have their lower or upper altitudinal limits at timberline.

Immediately above the forest boundary there is a band of ericaceous scrub whose composition and breadth vary with aspect. This vegetation band is narrowest and least diverse on the wetter and steeper slopes to the west and south, and is widest and contains the greatest diversity of shrubs on the drier and gentler northern and eastern slopes. Vast areas between the Marania and Hinde Valleys are covered by this little-explored vegetation. Fires are a regular occurrence in this habitat (Bill Woodley, Phil Snyder, personal communication), perhaps occurring at intervals of several years (Bongo Woodley, personal communication).

At higher altitudes (3400–3700 m) this ericaceous scrub merges gradually into the classic afroalpine vegetation, with its characteristic giant rosette plants (*Lobelia* and *Senecio* spp). The more level valley bottoms and (except at great altitude) ridges are wetter and contain a more lush vegetation than the slopes, which are characterised by sparser vegetation cover and drought resistant species (Young and Peacock 1992). At nearly all alpine sites above the heather, the tussock grass *Festuca pilgeri* is the dominant plant. In some sites it forms virtual monocultures of large tussocks, especially on wetter aspects between 3600 and 4100 m. The greatest diversity of plant species appear to be at middle alpine altitudes (3900–4200 m), at least on the western slope. Above 4100 m, the vegetation gradually becomes sparser, and plants are rare above 4500 m.

In addition to altitude and topography, the age of *Senecio keniodendron* stands is a key determinant of plant community composition. This species occurs as single-sized (and presumably single-aged) stands on mid-altitude slopes. In the Teleki Valley, the understoreys of younger stands are characterised by *Festuca pilgeri* and *Helichrysum* spp, and the understoreys of older stands are characterised by nearly monospecific stands of *Alchemilla* spp (Young and Peacock 1992). The latter appear to be favorite resting spots for Grimm's Duiker.

In addition, virtually all major drainages contain running water throughout the year, and there are numerous permanent tarns, occurring at altitudes of 3000 to 4500 m.

## MOUNT KENYA'S ALPINE VERTEBRATES

### Fish (3 spp)

*Salvelinus alpinus* (Arctic Char, American Brook Trout)

Not native; stocked in Lake Hohnel in 1949, but apparently failed to breed there (Copley 1953, Watson 1988). They are extinct there now (John Omira Miluwi, personal communication).

*Salmo trutta* (Brown Trout)

Not native; stocked in the Ontilili, Hinde, and Sirimon rivers (Coe and Sale 1971, Watson 1988).

*Salmo gairdnerii* (Rainbow Trout)

In addition to the two species above, Mills (1971) reports that Rainbow Trout were introduced to Kenya. This species is present in the Teleki Valley (Naro Moru River), and perhaps also in the Marania and Kazita rivers. The upper Naro Moru River in Teleki Valley has been heavily fished in the past (J. Omira, personal communication), but was supporting fair numbers of fish in 1989–90, when MRE was given a gravid female weighing 1 kg. The trout in the Marania and Kazita rivers are numerous and under-sized (TPY, personal observation). Bongo Woodley reports that this species has been recently released into Rutundu, Alice, Ellis and Carr Lakes, where they do not breed due to a lack of flowing water. At these lakes, 1–2 kg fish are commonly caught, and a 3.5 kg trout was caught in Lake Alice (Bongo Woodley, personal communication).

### Amphibians (2 spp)

*Phrynobatrachus kinangopensis* Angel

Loveridge (1957) reports this species as high as 3350 m. In addition to this and the following species, Tom Madsen (personal communication) suggests there are others just above timberline on the Sirimon Track.

*Rana wittei* Angel

This species is the common larger (body length 5 cm) frog in the lower alpine on the Timau Track, where it breeds in the Kazita River. It also occurs on the Sirimon Track (T. Madsen, personal communication). A sighting of probably this species by Alan Smith and TPY at 3800 m in the Hinde Valley is apparently an altitude record for an amphibian in East Africa. Bongo Woodley reported frogs from Lake Alice and the Nithi River in August 1993 (personal communication).

**Reptiles (6 spp)***Algyroides alleni* Barbour (Alpine Meadow Lizard)

*Algyroides alleni* is common throughout the drier parts of the mountain. TPY has encountered them in the Sirimon, Liki, Marania, Kazita, Hinde, Gorges, and Hobley Valleys at altitudes of 3400–4600 m, but not in the wetter Teleki or Hohnel Valleys. However, MRE has seen one just down the ridge from Two Tarn Hut. Their upper limit is represented by a population just south of Kami Hut at the head of the Mackinder Valley, and may be an altitude record for an East African reptile. At this site, the lizards live amongst the rocks, whereas at lower altitudes they are usually found in and on grass tussocks of *Festuca pilgeri*. Coe (1969) found eggs of this species at 3800 m.

*Mabuya irregularis* Lonberg (Skink)

TPY found this skink at 3600 m in dry scrubby grassland 4 km north-west of Ithanguni Peak in 1982. Its alpine distribution is not known. The genus is currently under taxonomic review, and it is possible that the alpine form is a distinct species (T. Madsen, personal communication).

*Chameleo schubotzi* Sternfeld (Kenya Side-striped Chameleon)

The type of this species (then *C. bitaeniata schubotzi*) in 1912 is recorded as being collected from 14,000 feet (4200 m) on Mount Kenya (Loveridge 1957), but such an extreme height seems unlikely. In June 1978 Alan Smith and TPY found an individual at 3850 m on the ridge west of the Hobley Valley. It was on the leaf of a *Senecio keniensis (brassica)* rosette about 0.5 m tall. James Hebrard (1981) reports that they are not uncommon in the ericaceous scrub just above treeline on Mount Kenya, and prefer the scrub layer less than two meters above the ground.

*Chameleo hohnelii* Steindachner (Hohnel's Chameleon)

This species appears to be restricted to the ericaceous scrub just above treeline, and prefers the vegetation more than two meters above the ground (Hebrard 1981).

*Vipera hindei* Boulenger (Hinde's Viper)

This snake, which is reportedly not uncommon in the alpine grassland of the Aberdare Mountains (A. McKay, personal communication), also occurs in alpine Mount Kenya. Individuals have been reported from the northern slopes by Raymond Hook (Moreau 1944), Phil Snyder, and Nigel Trent (personal communications). With Tim Tear, TPY photographed a small individual on the Timau Track at 3400 m in September 1982. Bongo Woodley found two Hinde's Vipers (13 and 20 cm long) on the shore of Lake Alice in March 1993 (personal communication).

*Psammophylax variabilis multisquamis* Loveridge (Striped Grass Snake)

Reported from Mt Kenya's 'high grass moorlands' (Sprawls 1978). Bongo Woodley saw a long thin snake along the Nithi River above the roadhead on the Chogoria Track in March 1993 (personal communication), perhaps of this species.

**Birds (58 spp)***Tachybaptus (Poliiocephalus) ruficollis capensis* (Pallas) Salvadori (Little Grebe or Dabchick)

Reported by Moreau (1944) from Lake Ellis (3450 m).

*Scopus umbretta* Gmelin (Hamerkop)

Reported from the Chogoria Track above treeline in March 1984 by Tim Tear (personal communication).

*Anastomus lamelligerus* Temminck (Open-billed Stork)

On at least two occasions, Open-billed Storks have visited the upper Teleki Valley. Coe and Sale (1971) reported a dead individual at the head of the valley (4180 m). In September 1976, a group of several birds landed in the valley in the vicinity of the Teleki Hut (4000 m) and, apparently unable to regain flight the next day, died there (John Omira Miluwi, personal communication). TPY saw several of these dead birds in 1977. Open-billed storks are regional migrants (Williams and Arnott 1980), and may occasionally mistake the boggy alpine valley bottoms for hospitable habitat, with fatal results.

*Ciconia ciconia* L. (White Stork)

Reported as an occasional visitor on migration by Williams (1978).

*Bostrychia (Lamprolaima) olivacea akeleyorum* (Dubois) Chapman (Green Ibis)

This high forest bird, recorded from 2000–3700 m (Britton 1980) is suspected of being at least partly nocturnal (Williams and Arnott 1980). Small groups are frequently heard and seen at dusk flying above the forest near the Met Station (3000 m) on the Naro Moru Track. Jackson (1938) quotes Akeley as seeing them on “Mount Kenya from 6,000–12,000 feet (timber line)”. In November 1979, John Imhof reported several pre-dawn encounters with honking, long-necked birds flying down the Teleki Valley at 4000 m. These birds may have been Green Ibises.

*Anas sparsa leucostigma* (Eyton) Rüppell (African Black Duck)

There are several resident pairs of Black Ducks on the tarns at 4000–4400 m. TPY found an abandoned nest with five eggs at Teleki Tarn (4300 m). It was located at the water's edge and made out of grass (*Festuca pilgeri*), lined with down, and covered by a layer of grass. TPY also saw a pair of adults with ducklings at Thompson's Tarn (4400 m). Coe (1967) reports other records of Black Ducks nesting on alpine tarns. They have also been seen on the Nithi River near Lake Ellis (Bongo Woodley, personal communication)

*Oxyura maccoa* Eyton (Maccoa Duck)

TPY found a male and three females on Lake Rutundu (3000 m) in September 1982.

*Sagittarius serpentarius* Miller (Secretary Bird)

TPY has seen only one individual, on the Timau Track at 3400 m in 1980, although other sightings by Bongo Woodley, Helen Young and Vince Fayad (personal communications.) between 1978 and 1993 imply they may not be uncommon along the Timau and Sirimon Tracks. Raymond Hook also reported one at 3960 m (Moreau 1944).

*Gyps rueppellii* Brehm (Rüppell's Vulture)

Occasional wanderer to the moorlands (D.A. Turner, personal communication)

*Gypaetus barbatus meridionalis* (L.) Keys. & Blas. (Lammergeyer)

Lammergeyers have been repeatedly sighted along the Sirimon Track near Sendeyo and Tereri Peaks. We have each seen one flying high above the Teleki Valley, in different years. These birds may be resident.

*Circus aeruginosus* L. (Eurasian Marsh Harrier)  
Reported as a migrant visitor by Williams (1978).

*Circus macrourus* Gmelin (Pallid Harrier)  
Reported as a migrant visitor by Williams (1978).

*Circus pygargus* L. (Montagu's Harrier)  
Reported as a migrant visitor by Williams (1978). Reported as high as 3700 m by Meinertzhagen (1937).

*Aquila rapax* Temminck (Tawny Eagle)  
Occasional visitor to the moorlands (D.A. Turner, personal communication)

*Aquila nipalensis* Hodgson (Steppe Eagle)  
Occasional visitor to the moorlands (D.A. Turner, personal communication)

*Aquila verreauxii* Lesson (Verreaux's Eagle)  
The distribution of Verreaux's Eagle in the alpine zone of Mount Kenya is patchy, and apparently related to the distribution of the Augur Buzzard. To our knowledge, the two species do not co-occur in any locality on Mount Kenya. Verreaux's Eagles are residents in the Gorges Valley, and can be seen in the Teleki Valley above 4200 m. We have both seen aggressive encounters between these two species. Whenever a Verreaux's Eagle entered the main Teleki Valley, it was almost immediately set upon by one or two resident Augur Buzzards and was driven out. On one occasion TPY saw an Augur Buzzard drive a Verreaux's Eagle away from a hyrax the latter had cornered on the ground.

Verreaux's Eagles reportedly feed mainly on hyrax, and this appears to be the case on Mount Kenya. TPY has seen several unsuccessful attacks on hyrax on the Teleki Valley, and flushed a Verreaux's Eagle off a recently killed hyrax in the Gorges Valley. The hyrax had been disemboweled.

*Buteo (rufofuscus) augur* Rüppell (Augur Buzzard)  
Augur Buzzards are common above treeline on Mt Kenya. We have seen them in all valleys except Gorges. Alan Smith and TPY found a nest built between the rosettes of a *Senecio keniodendron* Fries & Fries plant five m tall at 4200 m in the Hinde Valley. The nest was composed mostly of twigs and was about 50 cm in diameter. It contained three eggs. The nest and eggs were first visited in June 1978, and had been abandoned by July. Chris Laine (personal communication) and MRE have also seen Augur nests in *S. keniodendron* trees. In August 1980 TPY observed a nesting pair at 4000 m in the Liki North Valley. Their nest was located high on a vertical rock face. They appeared to be feeding young.

Our observations in the Teleki Valley and the examination of feeding perches (often dead *S. keniodendron* trees) and pellets indicate Augur Buzzards prey mainly on the rat, *Otomys orestes*. Coe (1967) and Peter Hetz (personal communication) report cases of Augur buzzards taking (young) hyrax, but we have seen no aggressive or apprehensive encounters between these two species. Two pairs of Augur Buzzards lived in the upper Teleki Valley (above 4000 m) in the late 1970s, each pair with a territory estimated at three to four km<sup>2</sup>. Four pairs were present from 3900 m in the Teleki Valley in 1989. They defended these against other Augur Buzzards and against Verreaux's Eagles (see above).

There are several melanistic birds above treeline on Mt Kenya, but they do not appear to be more common there than lower on the mountain.

*Buteo buteo* L. (Common Buzzard)  
Occasional visitor to the moorlands (D.A. Turner, personal communication) A. Forbes-Watson saw flocks above Sirimon Track at 3000–3200m in the 1950s (Bongo Woodley, personal communication).

*Buteo (tachardus) oreophilus* Hartert & Neumann (Mountain Buzzard)  
Moreau (1944) reported them out over the moorlands as high as 3500 m.

*Melierax (Micronisus) gabar* Daudin (Gabar Goshawk)  
MRE saw an individual in the Teleki Valley in February 1990.

*Milvus migrans* Boddaert (Black Kite)  
Reported as an accidental visitor by Williams (1978), probably as a passage migrant.

*Falco naumanni* Fleischer (Lesser Kestrel)  
Reported as a migrant visitor by Williams (1978).

*Falco tinnunculus* L. (Kestrel)  
Regular visitor to the moorlands on migration (D.A. Turner, personal communication).

*Francolinus jacksoni* Ogilvie-Grant (Jackson's Francolin)  
Jackson's Francolin has been described as mainly a forest bird, with the Montane Francolin replacing it in the moorlands (Williams and Arnott 1980, Lewis and Pomeroy 1989). However, we have found Jackson's Francolin to be common along the Naro Moru Track up to 4000 m, and have not seen any other francolin in the alpine zone of Mount Kenya (see also Nievergelt *et al.* 1987). Jackson's Francolin is also found on the Timau Track. At both localities, their calls can sometimes be heard late in the day.

*Francolinus psilolaemus* Gray (Moorland [Montane] Francolin)  
This species is reported to be the Moorland Francolin on Mount Kenya by Williams and Arnott (1980), but we have seen only Jackson's Francolin above treeline (see also Nievergelt *et al.* 1987). D.A. Turner reports that this species is "known only from the northern slopes of the mountain where the wheat fields approach the lower level of the moorlands, with no forest belt in between. The birds seen on Mt Kenya probably belong to the race *theresae*, reported as high as 3900m by Meinertzhagen (1937)". This is the Shelley's Francolin (*Francolinus shelleyi*) of earlier literature.

*Sarothrura affinis antonii* Smith (Chestnut-tailed [White-spotted] Pygmy Crake)  
Reported by Meinertzhagen (1937) from 3700 m and by Moreau (1944), though there are no recent records from Mt Kenya (D.A. Turner, personal communication)

*Fulica cristata* Gmelin (Red-knobbed Coot)  
TPY saw two pairs of Red-billed Coots on Lake Rutundu (3100 m) in September 1982. One pair had five very young chicks. Also reported from Lake Ellis by Moreau (1944).

*Vanellus melanopterus* Cretzschmar (Black-winged Plover)  
Reported as an uncommon visitor to the moorlands by Williams (1978).

*Gallinago nigripennis* Bonaparte (African Snipe)  
The African Snipe is often flushed from wet moorlands at altitudes up to 3700 m (according to D.A. Turner, to 4000m). We have seen them on the Timau, Sirimon, and Naro Moru Tracks.

*Tringa nebularia* Gunnerus (Greenshank)  
Reported as a visitor by Williams (1978), probably as an annual visitor.

*Tringa ochropus* L. (Green Sandpiper)

TPY saw a Green Sandpiper in September–November of each of 1979, 1980 and 1981, in the wetlands at the head of the Teleki Valley, probably on migration. Each visit lasted several days, and all may have been by the same individual.

*Actitis hypoleucos* L. (Common Sandpiper)

Tim Tear saw Common Sandpipers at Lake Rutundu in September 1982.

*Columba guinea* L. (Speckled Pigeon)

Pairs and small flocks of Speckled Pigeons appear to be residents in the Kazita and Hogley Valleys as high as 4000 m.

*Tyto capensis* Smith (Cape Grass Owl)

Reported from the marshy hollows on moorlands by Williams (1978). No recent records.

*Asio capensis* Smith (African Marsh Owl)

Reported from moorlands by Williams (1978). No recent records.

*Asio otus graueri* L. (Long-eared Owl)

Reported from thickets on moorlands by Williams (1978). D.A. Turner reports a “female collected at 3350 m in Hagenia woodland high on the Naro Moru Track 10 September 1961, while a large owl seen by the Park Warden (Bongo Woodley) flying over giant heath just above tree line in July 1992 may have been this species.”

*Bubo capensis mackinderi* (Smith) Sharpe (Mackinder’s Eagle-owl)

Common although rarely seen, Mackinder’s Eagle-owls were often heard at night as high as 4200 m. Sessions (1972) reports them from 2440–4270 m. When encountered by day, they are relatively unafraid of man, and can sometimes be approached to within a few feet (see also Sessions 1972). TPY has seen hyrax mobbing a Mackinder’s Eagle-owl that had landed in the vicinity of their burrows in the Teleki Valley. MRE’s analysis of ~50 pellets revealed a diet consisting of almost exclusively *Otomys*, with remains of shrews found in three pellets, and a duiker jaw in another. Sessions (1972) reports that “at the head of the Teleki Valley on Mt. Kenya I found nearly every pellet to contain the bone of the rock hyrax”.

*Caprimulgus poliocephalus* Rüppell (Montane Nightjar)

TPY heard nightjars flying around a camp at 4200 m Hogley Valley at dusk in 1978. Tim Tear saw one at dusk while camping at 3500 m in the Kazita Valley in 1982. Other possibilities include *C. abyssinica* (reported by Moreau (1944) from 3500 m) and *C. europaeus*. D.A. Turner reports *C. poliocephalus* as being common in timberline and ericaceous habitats (personal communication), and both he and A. Forbe-Watson (personal communication) believe it to be the present species.

*Apus aequatorialis* von Muller (Mottled Swift)

Resident alongside Alpine Swifts on alpine cliffs (D.A. Turner, personal communication)

*Apus melba africana* L. (Alpine Swift)

Alpine Swifts can be found along streams and tarns to 4300 m or higher, particularly around Two Tarn Hut. MRE has seen them in the Gorges Valley.



*Schoutedenapus (Apus) myoptilus* Salvadori (Scarce Swift)

Williams (1978) reports that Scarce Swifts “probably nests in crags on alpine moorlands”. D.A. Turner reports this species as commonly recorded over the moorlands (personal communication).

*Merops* sp. (unidentified bee-eater)

MRE has seen a flock of unidentified bee-eaters flying over the Teleki Valley in March 1989.

Possibilities include the migrants *M. apiaster* L. (Eurasian Bee-eater) and *M. albicollis* Vieillot (White-fronted Bee-eater).

*Hirundo rustica* L. (Eurasian Swallow)

Occurs regularly over the moorlands on migration (D.A. Turner, personal communication). TPY sighted a single individual in the upper Teleki Valley in early 1978. MRE caught one in the Teleki Valley in March 1989. This species is also listed by Williams (1978).

*Riparia paludicola ducis* (Vieillot) Reichenow (African Sand Martin)

African Sand Martins are apparently not uncommon along river courses on the northern slopes. TPY found individuals at nesting burrows in the banks of the southern Kazita River at 3800 m in 1982. We have also seen this species along the Naro Moru river around 4100 m. There are abandoned nesting holes, apparently of this species, in the bare vertical stream banks.

*Psalidoprocne pristoptera* Rüppell (Black Rough-wing Swallow)

Reported by Moreau (1944) as breeding only in the forest, but foraging as high as 4100 m. MRE has seen them foraging above the river in the Teleki Valley at 3900 m.

*Oenanthe oenanthe* L. (Northern Wheatear)

TPY sighted a single individual (on migration?) in the upper Teleki Valley in 1978. This species is also listed by Nievergelt *et al.* (1987) at 3800 m and by Williams (1978).

*Cercomela (Pinachroa) sordida ernesti* (Rüppell) Sharpe (Alpine or Mountain Chat)

A common resident of alpine Mount Kenya, Mountain Chats are aggressive camp scavengers, and have been reported as high as 4570 m (Meinertzhagen 1937). Coe (1969) reported a nest in a tussock of *Festuca pilgeri*, and MRE found three nests in *Festuca* tussocks. TPY found three nests excavated from the dense layers of leaves retained around *Senecio keniodendron* trunks, and one between the living leaves of a *S. keniodendron* rosette. All of the nests we have found contained three eggs. The nests were 1–2 m above the ground. We have seen these birds eating both seeds and insects, and visiting the flowers of *Lobelia deckenii keniensis* (Young 1982). White pollen slashes can often be seen on their foreheads where *L. d. keniensis* flowering is common. Although reported to be an alpine endemic (Williams and Arnott 1980), TPY has seen them as low as the town of Naro Moru (2000 m).

*Bradypterus cinnamoneus* Rüppell (Cinnamon Bracken Warbler)

Reported by Moreau (1966) as high as 3850 m on Mount Kenya.

*Phylloscopus trochilus* L. (Willow Warbler)

MRE caught an individual in the Teleki Valley in February 1989.

*Cisticola hunteri* Shelley (Hunter's Cisticola)

Hunter's Cisticola, easily identified by its distinctive duet, is common throughout the lower alpine zone, wherever taller ericaceous scrub is available (up to 4000 m).

*Anthus cervinus* Pallas (Red-throated Pipit)

An occasional visitor to the moorlands on migration (D.A. Turner, personal communication). An individual Red-throated Pipit visited the research camp in the Teleki Valley in September–October of 1979 and 1980.

*Macronyx sharpei* Jackson (Sharpe's Longclaw)

Vagrant to the lower moorlands (D.A. Turner, personal communication). Reported by Raymond Hook as high as 3950 m (Moreau 1944).

*Onychognathus tenuirostris raymondi* (Rüppell) Meinertzhagen (Slender-billed Chestnut-winged Starling)

Coe (1967) reports this species as a daily migrant from the forest to the alpine zone, usually in flocks of less than a dozen. This agrees with TPY's observations in the years 1978–80. However, during the May–August 1977 field season, an entirely different situation prevailed. Flocks of up to 100 starlings were regularly seen in the upper Teleki Valley. These large flocks were seen mobbing the resident Augur Buzzards on several occasions. Three starling nests were discovered in the rocky cliffs of the Naro Moru river around 4100 m. One of these nests contained three eggs. When visited six weeks later (in late July), all these nests were empty.

The starlings fed most frequently on *Lobelia deckenii keniensis* inflorescences. White pollen slashes were often seen on their foreheads (see also Meinertzhagen 1937). These inflorescences produce copious nectar and harbor large numbers of insects. The density of reproductive *L. d. keniensis* plants in 1977 was more than double the density in any of the next four years. In 1978–1983, *L. d. keniensis* inflorescences continued to be visiting starlings' main food source in the upper Teleki Valley.

The situation of 1977 was repeated in 1983–84, another mass flowering year for *L. d. keniensis*. In June 1983, TPY discovered an active starling nest at 4300 m in the Teleki Valley. It was located in a deep crevice at the top of a 15 m waterfall. Adults constantly flew into and out of this crevice, and the cries of chicks could be heard. These starlings normally nest around waterfalls in the forest (Williams and Arnott 1980). It appears the Slender-billed Chestnut-winged Starlings, which normally nest in the forest and only make occasional forays into the alpine, are attracted by the mass flowering of *L. d. keniensis* in 1977 and 1983 to become short-term residents of the alpine zone, and even nest there. Jackson (1938) cites Mackinder as reporting breeding birds high in the Hohnel Valley (in 1899). A. Forbes-Watson found starling nests at 4200 m in the Hinde Valley in early 1955, under rock overhangs (Bongo Woodley, personal communication).

MRE has seen small flocks flying up the valley, and larger flocks (up to 50 birds) flying down. He has seen them feeding around the cliffs below Lewis Glacier, and on the eastern side of Point Lenana.

*Nectarinia johnstoni johnstoni* Shelley (Scarlet-tufted Malachite Sunbird)

This sunbird is a common resident on Mount Kenya, visiting both *Lobelia telekii* and *L. deckenii keniensis* (Young 1982) throughout the alpine zone up to 4300 m, and *Protea kilimandscharica* in lower alpine areas on the northern slopes. They also hawk for small insects.

Evans (1991) considers their breeding season to be December to April. Williams (1951) reports their nesting periods as January–February and July–August. Mackinder found nestlings in August (Moreau 1944). TPY has seen nesting birds in December, January, June, and July. MRE believes their breeding season to be highly variable, e.g. the end of November in 1989–90 and the beginning of January in 1990–91. In agreement with Williams (1951) and Coe (1967), these nests usually contained only a single egg or nestling. MRE found only four nests (out of 100) with two eggs. Above 4100 m, the most common nesting sites TPY found were *Festuca pilgeri* grass tussocks, although there was one in an old *S. keniodendron* inflorescence, and one in an *Erica arborea* shrub. For other examples of the first two,

see Photos 1 and 2 in Williams (1951). MRE, working at lower elevations, found *Erica* shrubs to be the most common nesting sites, followed by *Lobelia telekii* inflorescences, grass tussocks, and *Senecio keniodendron* inflorescences. In his description of their nests, Williams reports that they were lined with 'vegetable down'. TPY identified similar material as the felty pubescence from the undersides of *Senecio keniensis* (*brassica*) leaves., and deposited a sample nest at the National Museums of Kenya.

Males are strongly territorial, without obvious seasonality. TPY estimated territory sizes around his research camp at 1000–2000 m<sup>2</sup>, larger than the 60–250 m<sup>2</sup> reported by Williams (1951) and Coe (1961). Territory size may vary with environmental quality: territories were smaller in a year with high densities of *L. telekii* inflorescences than in a year with lower inflorescence density (Evans 1991). TPY found non-territorial males congregated in noisy groups of up to 10 on several occasions, accompanied by a few females and often some Mountain Chats (see also Williams 1951). Recently, an experimental study has been carried out in the Teleki Valley on the costs and adaptive values of the elongated tail feathers and bright red pectoral tufts (Evans 1991, Evans and Thomas 1992, Evans and Hatchwell 1992a, 1992b).

*Nectarinia tacaze jacksoni* Stanley (Tacazze Sunbird)

We have found Tacazze Sunbirds on Mount Kenya visiting both *Lobelia* spp at altitudes up to 4000 m.

*Serinus canicollis* Swainson (Yellow-crowned Canary)

The absence of these canaries from Alpine Mount Kenya puzzled Moreau (1944), who found it "astonishing to me because on the great mountains of northern Tanganyika the species ascends to the limits of vegetation and beyond". In response, Raymond Hook stated: "In my opinion on both Kenya and Aberdares, they go as high as the Compositae go. I would have said that they ate practically every kind of compositae, including the Giant Groundsel [*Senecio keniodendron*]" (Moreau 1944). TPY had never seen canaries above treeline before 1979. In 1978–79, the Giant Groundsel of Mount Kenya gregariously flowered, a rare occurrence (Smith and Young 1982). When these plants began to set seed, canaries began to appear in the lower alpine. By November 1979, there were hundreds of Yellow-crowned Canaries visiting fruiting stands of *S. keniodendron* up to 4200 m, feeding on the ground. A few were even seen feeding (on windswept seeds?) on the Lewis Glacier at 4700 m. The canaries disappeared from the alpine zone shortly thereafter. MRE saw occasional single birds in 1989–90 at 3800–4000 m.

*Serinus striolatus striolatus* Rüppell (Streaky Seedeater)

The Streaky Seedeater is a common resident throughout the alpine zone. TPY found an abandoned nest composed mainly of grass atop a *Festuca pilgeri* grass tussock at 4200 m in the Teleki Valley. It contained one dead chick and one unhatched egg. MRE has also seen many nests started, but none successful.

*Corvus albicollis* Latham (White-naped Raven)

Alan Smith reported a White-naped Raven at the research camp (4180 m) in 1984. Moreau (1944) also reports them as high as 3660 m. This species is a common camp visitor on the Shira Plateau on Kilimanjaro.

**Mammals (43 spp)**

*Graphiurus murinus raptor* Dollman (African Dormouse)

The Dormouse is commonly found in alpine huts, where its loud chattering vocalisations keep visitors awake at night. TPY saw an individual on the rocks below Lake Michaelson (3800 m) during the day in

September 1978. Dormice have been trapped up to 4180 m both on the northern slopes by Coe and Foster (1972) and in the Teleki Valley by TPY.

*Dendromus insignis percivali* Heller (Striped Tree Mouse)

Common in the alpine zone on all aspects at altitudes up to 4330 m (Moreau 1944, Coe and Foster 1972). This was the most common small rodent trapped at night at TPY's research camp (4180 m). Bongo Woodley reports rodents from 'Black Hole Bivvy' (4550 m) above the Teleki Valley in September 1991 (personal communication), perhaps of this species.

*Lophuromys flavopunctatus* Thomas (Harsh-furred Mouse)

Coe and Foster (1972) report this species is common on the northern slopes as high as 4100 m. MRE had a family living near in his lavatory at 3900 m.

*Lemniscomys striolatus massaicus* Pagenstecher (Striped Grass Mouse)

Not previously reported from the alpine zone (but see Moreau 1944), TPY saw one on the rocks near Lake Michaelson, and MRE has seen them feeding on *Lobelia telekii* seeds in the Teleki Valley.

*Rhabdymus pumilo diminutus* Thomas (Four-striped Grass Mouse)

This species was trapped as high as 3800 m on the northern slopes by Coe and Foster (1972).

*Praomys (Hylomyscus) denniae* (Climbing Wood Mouse)

Reported by Fayad (1981) from alpine Mount Kenya, and perhaps seen by MRE in a *Senecio keniodendron* stand in 1989.

*Tachyoryctes splendens (rex)* Rüppell (Mount Kenya Mole Rat)

The Mount Kenya Mole Rat is common throughout the northern slopes and the Hinde Valley at altitudes up to 4050 m on the northern slopes, and 3750 elsewhere (Jarvis and Sale 1971; personal observation). Their mounds are up to 6 m in diameter, and can be recognised at a distance by the strikingly different vegetation growing on them, dominated by *Alchemilla* spp (Jarvis and Sale 1971, Coe 1969, Coe and Foster 1972; personal observation). In some localities, the mounds are virtually overlapping. The animals themselves are rarely seen. There has been debate recently about whether the origin of 'mima-type' mounds in Kenya is due to the activities of termites or mole rats (Gakahu and Cox 1984, Martin 1988). There are no termites above treeline on Mount Kenya or the Aberdares, but this does not mean that all alpine mounds are caused by Mole Rats. Frost-thaw processes in the alpine zone can also produce vast areas of mounded terrain (Baker 1967).

They feed mainly on roots and subterranean stems. They appear to be the only mole rat in Kenya (out of three genera) that stores food. Roots and leaves of the alpine plant *Haplosciadium abyssinicum* were found in a food store at 3600 m on Mount Kenya (Jarvis and Sale 1971). *Otomys* entrances into *Tachyoryctes* burrows have been found on Mount Kenya (Jarvis and Sale 1971).

*Otomys orestes orestes* Thomas (Groove-toothed Rat)

The Groove-toothed Rat is probably the most common alpine rodent on Mount Kenya, occurring at all altitudes and aspects. It is the most common food item identifiable in the scat and pellets of Leopard, Augur Buzzard, and Mackinder's Eagle-owl. These rodents are often seen during the day along their conspicuous runs. TPY has seen several chases between adults, and they may be territorial. Reported as high as 4750 m (Moreau 1944, Coe 1967).

*Otomys tropicalis tropicalis* Thomas (Groove-toothed Rat)

This second alpine *Otomys* species is reported from 2280–4175 m (Hollister 1919). Coe and Foster (1972) found only *Otomys orestes*, and question the presence of *O. tropicalis*.

*Hystrix* sp. (Porcupine)

Fayad (1981) reports alpine porcupine, and Moreau (1944) found a quill at 3500 m above Nanyuki.

*Lepus* sp. (Hare)

The existence of a hare in the lower moorlands of Mount Kenya was suggested by Raymond Hook (Moreau 1944) who twice found their dung at 3350 m. Phil Snyder has reported seeing a hare just above timberline on several occasions. He described them as relatively large, and yellowish.

## (Unidentified bat)

An unidentified species of bat occurs at Lake Rutundu (3000 m), perhaps the African Pipistrelle (*Pipistrellus nanus*) reported by Williams (1978) from high forest.

*Crocidura allex alpina* Heller (Alpine Pygmy Shrew)

Apparently common in the alpine zone. Coe and Foster (1972) report it as high as 4100 m on the northern slopes. TPY trapped an individual at night at 4180 m in the Teleki Valley in early 1978, and saw another in daylight at 3800 m in early 1980.

*Crocidura fumosa* Thomas (Dusky Shrew)

Coe and Foster (1972) trapped a single individual at 3800 m on the northern slopes, and report it to be common at lower altitudes. They also list *C. turba*.

*Crocidura turba zaodon* Osgood (Dusky Shrew)

Coe and Foster (1972) suggest that some of their *Crocidura* specimens may have been this subspecies. Reported by Moreau (1944) as high as 3260 m on Mount Kenya in forest.

*Myosorex (Surdisorex) polulus* Hollister (Mole Shrew)

Trapped by Coe and Foster (1972) at 3920 m on the northern slopes. Moreau (1944) reported it at altitudes of 2750–3680 m. Kingdon (1974), reporting it at altitudes of 2800–3600 m, states that it is the only endemic mammal on Mount Kenya.

*Cercopithecus mitis* Wolff (Sykes' Monkey)

In November 1979, TPY was shown a Sykes' Monkey found in the rocks below the Darwin Glacier (4600 m) by Vince Fayad. Its head and limbs were missing, and it was in a mummified state. Local climbers state that it had been at that location for at least a year. In December 1990, another Sykes' Monkey was reported from Top Hut (4800 m) by Clive Ward. It was complete, and only recently dead. We cannot explain the presence of these individuals (or the following) so high on the mountain.

*Colobus polykomos* Oken (Abyssinian Black-and-white Colobus Monkey)

A 'mummified' colobus on Point Peter (4700 m) has been reported by several mountaineering parties. It can only be this species.

*Lycaon pictus* Temminck (African Wild Dog or Hunting Dog)

Coe (1967) reports several packs as high as 4250 m, preying upon zebra and eland. As recently as the 1960s packs of Wild Dogs were taking sheep off the moorlands above Embori Farm, but not in the

1970s or early 1980s (Bill Halstead, personal communication). In January 1992, John Temple reported Wild Dogs on the Timau (3000 m) and Chogoria (3500 m) tracks (personal communication).

*Canis mesomelas* Schreber (Black-backed Jackal)

An unspecified species of jackel was reported by Raymond Hook at altitudes of up to 3660 m (Moreau 1944), and Fayad (1981) listed that Black-backed Jackals from the alpine zone.

*Ictonyx striatus* Perry (Zorilla)

Zorilla are apparently residents of the alpine zone of Mount Kenya. Raymond Hook reported them as high as 3660 m (Moreau 1944). Coe (1969) collected one at 4270 m on the northern slopes that had been feeding on *Otomys* rats. On the night of 7 October 1979, a visitor to TPY's research camp (4180 m) saw a live Zorilla. N. Barrah saw a Zorilla at the nearby Teleki Valley Ranger Station in September 1993, also at night (Bongo Woodley, personal communication). TPY found a Zorilla skull in the rocky moraine below Mackinder's Camp (4150 m) in 1978. This is now on deposit at the Department of Osteology, National Museums of Kenya (ref. # OM 6432). MRE saw one at his camp near this same site in February 1989. Judging by the repeated presence of a distinctive odor, especially early in the morning, TPY believes that a Zorilla lived in the rocky outcrop below the 12,000 foot rain gauge (at ~3600 m) on the Naro Moru Track, in the late 1970s.

*Genetta tigrina* Schreber (Large-spotted Genet)

Reported by Fayad (1981) from alpine Mount Kenya.

*Herpestes paludinosus* G. Cuvier (Marsh Mongoose)

Coe (1967, 1969) reported a pair of Marsh Mongooses from 3500 m in the Gorges Valley.

*Herpestes sanguineus* Rüppell (Black-tipped [Slender] Mongoose)

Fayad (1981) reports this species from the alpine zone.

*Crocuta crocuta* Erxleben (Spotted Hyaena)

Spotted Hyaena are apparently regular, if infrequent, visitors to the alpine zone. TPY has seen tracks as high as 4000 m in the Teleki Valley, and they have been reported much higher. Tracks that TPY saw on the Lewis Glacier (4800 m) in 1979 were probably also of hyaena. In 1986, Bongo Woodley found tracks coming up from the Teleki Valley, crossing near Austrian Hut (4800 m) and descending into Holey Valley (personal communication). Bill Halstead reports that they visit the moorlands particularly during the rains. MRE had one around his camp (4100 m) daily in February–April 1989.

*Acinonyx jubatus* Schreber (Cheetah)

Nigel Trent reported seeing a cheetah at around 3500 m along the Timau Track in 1982. There have also been sightings of Cheetah from the Sirimon Track at and above 4000 m (Campbell 1983).

*Felis serval* Schreber (Serval Cat)

Serval Cats are common in the alpine zone of the Aberdare Mountains, and may also occur on Mount Kenya (see Moreau 1944).

*Felis lybica* Forster (Wild Cat)

The Wild Cat is known from the northern slopes up to 3800 m (Coe and Foster 1972), and may be common there (Coe 1969).

*Panthera leo* L. (Lion)

Lions are apparently occasional visitors to the alpine, and may stay for several weeks, such as the individuals that were seen repeatedly around the Sirimon roadhead in 1977. It is also possible that this is part of a small resident population. TPY has seen pug marks at 3600 m on the Naro Moru Track.

*Panthera pardus* L. (Leopard)

Leopard are resident in the alpine zone of Mount Kenya. We have found their tracks, droppings and cave shelters throughout the alpine. TPY has encountered a leopard only once in the alpine zone, but there have been numerous sightings of leopards by others (Martin Otieno, John Omira Miluwi, Phil Snyder, Lew Awodey), including a melanistic individual in the Teleki Valley (John Omira Miluwi). MRE has seen the pug marks of a female and her cub in the Teleki Valley. They apparently cross passes as high as 4800 m (Coe 1967).

TPY has found two duikers (one in the Teleki Valley at 4300 m, one in the Hinde Valley at 4100 m) apparently killed by leopards. Examination of several leopard dens (overhanging rocks) revealed large numbers of hyrax bones. Scats collected on Mount Kenya contained occasional hyrax bones and often the remains of Groove-toothed Rats.

*Procavia johnstoni mackinderi* Thomas (Mount Kenya Rock Hyrax)

Hyrax are the most conspicuous mammals of alpine Mount Kenya. There are several hundred in the upper Teleki Valley alone, where TPY estimates the average density to be in the neighborhood of 20–100 animals per km<sup>2</sup>. A description of their habits is found in Coe (1962) and Sale (1965). Kingdon (1971) reports them as occurring at 3200–4650 m. They have been reported as high as 4700 m (Moreau 1944) and even higher (Dorst and Dandelot 1972), but we have seen no evidence of them living higher than 4300 m. Although most individuals are dark brown, there was one adult male on the south side of the Teleki Valley at 4200 m during the 1980s that had very pale fur. 'White' hyrax (*Heterohyrax brucei*) also occur in the Serengeti (Hoeck 1982).

The Mount Kenya subspecies has evolved darker and longer fur than its lowland relatives, apparently as adaptations to the extreme cold (Coe 1962, 1967; Sale 1967). In addition, they can often be seen basking in the sun and huddling together, traits they share with other Rock Hyrax.

On Mount Kenya, the distribution of rock hyrax is delineated by the presence of appropriate shelter—the rocky moraines in which hyrax make their homes. We have never seen hyrax more than 150 m from these rocky shelters, and believe that their overall numbers are limited by the availability of these moraines. TPY did once find tracks of a hyrax high on a ridge between the Teleki and Hoehnel Valleys far from any established colony. This may have been a dispersing male, if comparisons to ecologically similar marmots are appropriate, and these animals are likely to be easy prey in the open (Van Vuren 1990). TPY has found one small isolated moraine that was once inhabited by hyrax, judging by the skulls present, but that no longer supported them. Local extinction of small isolated populations may not be a rare event in hyrax (Hoeck 1982) or other species (Smith 1980, Berger 1990), and more isolated areas may be only rarely colonised (Smith 1980).

In the vicinity of inhabited moraines the vegetation is closely cropped, and hyrax colonies can be recognised from a distance by the bright green vegetation surrounding the rocky outcrops, which contrasts with the pale, uncropped alpine grassland. Mahaney and Boyers (1983) suggest that this close cropping by hyrax and groove-toothed rats can produce bare areas of solifluction desert by allowing greater cooling of the soil.

Hyrax eat a wide variety of plant species, but seem to avoid certain plants (*Anthoxanthum nivale*, *Sedum ruwenzoriense*, *Carduus keniensis*) that are therefore common near active burrows (see also Coe 1962). Mahaney and Boyer (1983) examined hyrax dung microscopically, and found that 92% of the identifiable fragments were monocotyledons, and only 8% were dicotyledons.

Experimental removal of spines from *C. keniensis* leaves renders them readily palatable to hyrax (Young and Smith, in press). Descriptive and experimental evidence indicates that hyrax may limit the distribution of the shrub *Alchemilla argyrophylla* around colonies (Young and Smith, in press). They occasionally feed on the toxic *Lobelia* spp (Coe 1962, Young 1985), and even Giant Senecio (Young and Smith, in press), especially during dry periods.

Rock hyrax are mainly diurnal and feed mostly at mid-morning and mid-afternoon (Sale 1965, Coe 1969). They seem to avoid rainy weather, but TPY has occasionally seen hyrax feeding both on moonlit nights (see also Coe 1962 and Dorst and Dandelot 1972) and during rain, particularly if there was rain during the normal afternoon feeding period (4–5 PM).

The most important predators of alpine rock hyrax on Mount Kenya are undoubtedly leopards, which apparently stalk colonies (John Omira Miluwi, personal communication). Verreaux's Eagles also take hyrax in certain localities. Mackinder thought that Mackinder's Eagle-owls were important predators (Moreau 1944), but we have examined numerous Eagle-owl pellets and found no identifiable hyrax remains. Coe (1967) reports seeing an Augur Buzzard take a hyrax, but we have seen no aggressive behavior between these species.

TPY has observed several females that had lost all of the hair on their rumps, and the skin itself was raw to the point of bleeding. We do not know what causes this, but it matches to symptoms of sarcoptic mange reported by Hoeck (1982) in Serengeti hyrax.

As elsewhere (Sale 1965, Hoeck 1982) the hyrax colonies of Mount Kenya consist of a single adult male and differing numbers of adult females and immatures. TPY has seen several fights between males, often resulting in the loss of blood and substantial clumps of hair. Older males are often heavily scarred around the face and ears. Both sexes contest over food. In these encounters, animals will often turn their backs to each other and try to push the other away.

Female Mount Kenya Rock Hyrax give birth synchronously within a colony, with up to six litters appearing within a period of less than two weeks. Most commonly, these births were in June or December. Each colony has only one birth season per year, and it is usually the same month each year. Similarly, in the Serengeti, individual colonies had one birth season per year (Hoeck 1982). For *P. johnstoni*, this was in March to May. For *Heterohyrax brucei*, individual colonies had birth peak in either May–June or December–January, as in the Mount Kenya *Procavia*. An interesting exception occurred in the colony near TPY's camp in 1979. In the previous year, the young appeared in June, but the resident male was displaced by another in late 1978, and the subsequent brood was not born until September 1979. Hyrax have very long gestation periods (7.5–8 months), and it is possible that the change in dominant males disrupted the pregnancies of the colony's females.

On at least two occasions, hyrax have been seen giving birth above ground during the day (John Omira Miluwi, personal communication, and an anonymous observer, personal communication). This is in conflict with earlier information about hyrax (Sale 1965), and needs confirmation. However, given the likely low sanitation of hyrax burrows and the low risk of diurnal predation, such birthing behavior may be reasonable. In both cases, the observers were attracted by the many adult and yearling hyrax that gathered around the scene.

Young hyrax are very playful, and seem to spend the majority of their time in play. They suckle for at least several months. TPY has seen one pair suckling at the age of nine months. Unless mothers tolerate other females' young, Mount Kenya hyrax do have at least occasional litters of more than one (but see Coe 1967).

Coe (1962) reported two kinds of vocalizations, but we distinguish at least seven:

- A long, loud call, usually beginning with coarse mewing sound and ending with a series of coughing noises, is given by multiple individuals when people (personal observation) or leopards (J. Omira, personal communication) are seen at a distance. Upon hearing this call, mountain



rangers have initiated successful scans of nearby slopes for leopard. When foraging hyrax hear this call, they stop and look and then often run back to the safety of their burrows. This call and the next are the ones most often heard by people in the vicinity of colonies.

- A very similar 'long call' is given by territorial males, particularly in the evening, and may serve to advertise occupancy of colonies. These two calls are distinguished by their context and participants.
- A loud, sharp call is given when an eagle attacks. This produces an instantaneous reaction among foraging hyrax, which dive for the nearest cover.
- When foraging in close proximity, adult hyrax make a quiet, grunting 'contact call'.
- Juveniles make high-pitched squeaks in a variety of situations.
- Adult females also make a high-pitched squeaking noise when involved in antagonistic interactions with other adults females or the dominant male. This may be an appeasement vocalisation.
- During serious fights and chases, adult males (and sometimes females) make loud grunting noises.

Fourie (1977) has documented over twenty noises made by captive *P. capensis*, of which three were limited to females giving birth, and two were not vocalisations (sneezing and teeth gnashing).

#### *Loxodonta africana* Blumenbach (African Elephant)

Elephants are apparently regular visitors to alpine Mount Kenya. Moreau (1944) reports two well-worn alpine elephant trails on the alpine northern slopes. TPY has seen them eating Giant Groundsel (*Senecio keniodendron*) at 4000 m in the Teleki Valley. Numerous visits to the alpine zone of northwest Mount Kenya occurred in the late 1970s and early 1980s (Mulkey et al. 1984). It is not known whether this is strictly a recent phenomenon. A dead elephant was found at 4600 m in the Hinde Valley in 1944 (Taffe 1944). This animal was identified as a female by Michael Rainey in 1979 (personal communication).

#### *Diceros bicornis* L. (Black Rhinoceros)

Rhinos have been sighted on several occasions above the treeline. Lew Awodey found a recently dead individual (horn intact) near the Sirimon river at 3700 m in 1978 (personal communication). In 1983, Nigel Trent reported three resident animals above Timau (personal communication). They may be extinct there now, although they still occur in the forest.

#### *Equus burchelli* Gray (Burchell's Zebra)

There is at least one resident herd of zebras on the northern slopes, and probably several. They can be commonly seen along the Timau Track. TPY has seen zebra tracks throughout the northern slopes, as far south as the northern ridge of the Hinde Valley and as high as 3700 m. Coe (1969) reports their droppings as high as 4300 m. An aerial survey in June 1993 counted 299 zebras between Mbara Crater and the Kazita River (Bongo Woodley, personal communication).

*Alcephalus buselaphus cokii* Pallas (Kongoni or Coke's Hartebeest)

Seen along the Timau Track repeatedly in 1980 as high as 3700 m (Helen Young, personal communication). Raymond Hook found a skeleton at 4000 m on the northern slopes (Moreau 1944).

*Cephalophus nigrifrons* Gray (Black-fronted Duiker)

Williams (1978) reports this species in bamboo zone and on moorlands.

*Silvicapra grimmia altivallis* L. (Grimm's or Bush Duiker)

Grimm's Duikers are resident throughout the alpine, and are most common on slopes where *Alchemilla* spp are found (see Young and Peacock 1992), perhaps because these shrubs provide cover (Coe 1969) or food (King 1975). On a single day in 1978, TPY saw seven individuals in the Hinde Valley, and MRE from one position saw twelve in the lower Teleki Valley. They usually occur singly or in pairs. On the Aberdares and Kilimanjaro, they occur at densities of about two per km<sup>2</sup> (King 1975). MRE has seen prolonged chases between individuals, running round and round in a particular area.

TPY found two Grimm's Duikers that were apparently victims of leopard predation, one each in the Teleki (4300 m) and Hinde (4100 m) Valleys. In January 1992, John Temple reported a dead duiker (probably this species) high (~4900 m) on the Lewis Glacier (personal communication).

*Oreotragus oreotragus* Zimmermann (Klipspringer)

Reported by Williams (1978) and Fayad (1981), but we tend to agree with Moreau (1944) that they do not occur in the alpine zone of Mount Kenya. Dorst and Dandelot (1972) report that they occur up to 13,000 ft in Ethiopia, and Haltenorth and Diller (1980) up to 4000 m.

*Raphicerus campestris* Thunberg (Steinbuck)

Although Moreau (1944) believed that Steinbuck were merely visitors to the northern slopes, we concur with Coe (1969) and Coe and Foster (1972) that they are probably resident. Whether they "replace Grimm's duiker" there, as the latter authors suggest, is open to question. TPY has seen both steinbucks and duikers at 3000–3500 m along the Timau Track.

*Boocercus eurycerus* Ogilby (Bongo)

In 1979, Vince Fayad and TPY found the skeleton of an adult male bongo at 'American Camp' at 4300 m in the Teleki Valley. We did not find the skull, and identification was made from a femur and lower jaw by the Department of Osteology of the National Museums of Kenya (Nina Mudida, personal communication). This location is far from the normal forest/bamboo habitat of bongo, but Haltenorth and Diller (1980) say, "seasonal wandering around to particular feeding places is possible; also from forest to forest or mountain to mountain".

*Taurotragus oryx* Pallas (Eland)

There are up to several herds of eland on the northern slopes. A large herd can often be seen at the Sirimon track roadhead. TPY has seen young in these herds, and believes they are breeding residents (but see Coe 1969). A herd of 70 elands, including many subadults, was seen from the air at 'Brigands Retreat' in late 1990 (Bongo Woodley, personal communication).

*Syncerus caffer* Sparrman (African Buffalo)

African Buffalos are regular visitors to alpine Mount Kenya. The carcass of a bull was found at 4700 m (Ross 1911). They are common visitors to Lake Hoehnel (4200 m), and Martin Otieno has seen them there on several mornings. We have seen droppings as far up the Teleki Valley as 4150 m. Buffalo tracks and droppings can be seen on all game trails on the mountain, both in forest and alpine. Buffalo

maintain a trail between the Teleki and Hausberg Valleys at an altitude of about 4100 m. Their visits to the Teleki Valley are mainly nocturnal, but M. Peacock and TPY saw a lone bull at 3900 m on the north slope of the valley at midday in January 1980.

## DISCUSSION

The alpine environment on Mount Kenya is severe, with nightly freezing likely throughout the year, common dry periods, and low plant productivity (Hedberg 1964, Coe 1967, Smith and Young 1987). Nonetheless, a wide variety of vertebrate species occur there, and many seem to thrive. Some do so by using the alpine ecosystem only occasionally; others are permanent residents. Residents exhibit a variety of evolutionary adaptations and behaviours that help them to cope with the unique challenges of this environment. These include longer hair, darker colouration, basking in available sunlight, diurnal foraging patterns, and perhaps lowered reproductive rates.

Alpine Mount Kenya is a semi-isolated island ecosystem. The alpine habitats are very different from the forest surrounding them. This has led to a considerable amount of endemism and vicariance among the alpine plants (Hedberg 1957) and invertebrates (Salt 1987), but not among the alpine vertebrates. Of the species in Table 1, only the Mole-shrew (*Myosorex polulus*) is endemic to Mount Kenya, with vicariants on other East African mountains (Kingdon 1974). The Mount Kenya Rock Hyrax (*Procapra johnstoni mackinderi*) is an endemic subspecies.

Although the alpine habitats of Mount Kenya are island-like, there are three ways in which the alpine zone is accessible to animals from other ecosystems. First, birds can fly over the forest to reach the alpine zone. These may be altitudinal migrants (Yellow-crowned Canary), regional migrants (Open-billed Stork) or palearctic migrants (e.g., Harriers, Wheatear, European Swallow, Willow Warbler), as well as occasional visitors (e.g., Black Kite, Secretary Bird). The list of avian migrants and visitors is likely to increase in the future.

Second, resident forest species may venture out into the alpine moorlands, and even become partial residents there. Some of these visitors are difficult to explain, such as the Bongo, the two Sykes' Monkeys, and the Colobus Monkey. For others, the lower alpine zone may provide a suitable foraging habitat (e.g., Mountain Buzzards, Black-fronted Duikers, Green Ibises). Elephants, Buffalos and Slender-billed Starlings appear to be regular visitors from the forest to high in the alpine zone, with the latter occasionally nesting there.

Third, the treeless gap on the northern slopes has provided savanna species the opportunity to visit and colonise alpine Mount Kenya. This may be why Mount Kenya is the only alpine area in East Africa with populations of rock hyrax. It is possible that some of the larger mammals on the northern slopes were local migrants trapped by increasing development at lower altitudes, but their continuing success in the alpine suggests that this need not be the case. These species include Lion, Zebra, Eland, and Kongoni. Two highly endangered species, Black Rhino and Wild Dog, apparently still occur on Mount Kenya, the former perhaps restricted to the forest.

There are several other species whose status is unclear. These include those that have only rarely been reported (either because they are rarely seen or because they are nocturnal) or may have been misidentified: Striped Grass Snake, Green Ibis, Maccua Duck, Pygmy Crane, Montane and Shelley's Francolins, Long-eared Owl, Cape Grass Owl, Marsh Owl, an unidentified nightjar, Sharpe's Longclaw, Climbing Mouse, one of the Groove-toothed Rats (*Otomys tropicalis*), an unidentified hare, Porcupine, an unidentified bat, Jackal, Marsh Mongoose, Slender Mongoose, Genet Cat, and Serval.

As a conservative estimate, the confirmed resident vertebrate fauna of alpine Mount Kenya is as follows: two introduced fish, two frogs, two lizards, two chameleons, one snake, nineteen birds, seven rodents, three shrews, and ten larger mammals, for a total of 48. Two areas of the mountain in particular

are in need of more detailed information. The northeastern (and southwestern) slopes have only rarely been visited by biologists, who have concentrated their attention on the areas along the main tracks (Naro Moru, Sirimon, and to a lesser degree Chogoria). Also, the areas just above the forest, the ericaceous and lower alpine habitats, have been less studied relative to higher alpine areas. It is hoped that future studies of these areas will both increase and refine our knowledge of Mount Kenya's alpine vertebrates.

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Table 1. Alpine vertebrates of Mount Kenya. Upper altitudinal limits are based on the literature (questionable records not included) and personal observations. Lower altitudinal limits for Mount Kenya are included when they are known, but not if the records merge into a forest or lowland population. Status: First letter(s) indicate nature of occurrence: r= resident, v= visitor, m= migrant, i= introduced, x=accidental. An asterisk indicates evidence of breeding (courtship, nesting, young). The second letter(s) indicate abundance; a= abundant, c= common, o = occasional, r= rare, e= locally extinct.

SPECIES (112 spp)	Latin Name	Altitude (m)	Status
<b>Fish (3 spp)</b>			
Char	<i>Salvelinus alpinus</i>	up to 4300	i, e?
Brown Trout	<i>Salmo trutta</i>	up to 4000?	i*, c
Rainbow Trout	<i>Salmo gairdnerii</i>	up to 4200	i*, c
<b>Amphibians (2 spp)</b>			
Frog	<i>Phrynobatrachus kinangopensis</i>	up to 3350	r, c?
Frog	<i>Rana wittei</i>	up to 3800	r, c?
<b>Reptiles (6 spp)</b>			
Alpine Meadow Lizard	<i>Algyroides alleni</i>	3400–4600	r*, a
Skink	<i>Mabuya irregularis</i>	up to 3600	r?, or
Kenya Side-striped Chameleon	<i>Chameleo schubotzi</i>	up to 4200	r, c
Hohnel's Chameleon	<i>Chameleo hohnelii</i>	up to 3400	r, c?
Hinde's Viper	<i>Vipera hindei</i>	3000–3400	r, o
Striped Grass Snake	<i>Psammophylax variabilis</i>	?	?, ?
<b>Birds (58 spp)</b>			
Lesser Grebe (Dabchick)	<i>Tachybaptus ruficollis</i>	up to 3200	?, ?
Hamerkop	<i>Scopus umbretta</i>	up to 3200	v?, ?
Open-billed Stork	<i>Anastomus lamelligerus</i>	up to 4150	x, r
White Stork	<i>Ciconia ciconia</i>	?	x, ro
Green Ibis	<i>Bostrychia olivacea</i>	up to 4100?	v?, ro
African Black Duck	<i>Anas sparsa</i>	up to 4400	r*, c
Maccoa Duck	<i>Oxyura maccoa</i>	up to 3000	?, ?
Secretary Bird	<i>Sagittarius serpentarius</i>	up to 3500	v, o
Rüppell's Vulture	<i>Gyps rueppellii</i>	?	v, o
Lammergeyer	<i>Gypaetus barbatus</i>	up to 4300	r, o
Eurasian Marsh Harrier	<i>Circus aeruginosus</i>	?	m, ro
Pallid Harrier	<i>Circus macrourus</i>	?	m, ro
Montagu's Harrier	<i>Circus pygargus</i>	?	m, ro
Tawny Eagle	<i>Aquila rapax</i>	?	v, o
Steppe Eagle	<i>Aquila nipalensis</i>	?	v, o
Verreaux's Eagle	<i>Aquila verreauxii</i>	up to 4500	r, o
Augur Buzzard	<i>Buteo augur</i>	up to 4400	r*, a
Common Buzzard	<i>Buteo buteo</i>	?	v, o
Mountain Buzzard	<i>Buteo oreophilus</i>	up to 3500	?, ?

Table 1. *continued* Alpine vertebrates of Mount Kenya.

SPECIES	Latin Name	Altitude (m)	Status
Gabar Goshawk	<i>Melierax gabar</i>	4000?	m, r
Black Kite	<i>Milvus migrans</i>	?	v, r?
Lesser Kestrel	<i>Falco naumanni</i>	?	m, ro
Kestrel	<i>Falco tinnunculus</i>	?	m, o
Jackson's Francolin	<i>Francolinus jacksoni</i>	3400–4000	r, a
Moorland Francolin	<i>Francolinus psilolaemus</i>	up to 3900	r?, ?
Chestnut-tailed Pygmy Crake	<i>Saruthrura affinis</i>	up to 3700	r?, ?
Red-knobbed Coot	<i>Fulica cristata</i>	up to 3000	r*, ?
Black-winged Plover	<i>Vanellus melanopterus</i>	?	v, ?
African Snipe	<i>Gallinago nigripennis</i>	3450–3800	r, a
Greenshank	<i>Tringa nebularia</i>	?	m, r
Green Sandpiper	<i>Tringa ochropus</i>	up to 4180	m, r
Common Sandpiper	<i>Actitis hypoleucos</i>	up to 3000	?, ?
Speckled Pigeon	<i>Columba guinea</i>	up to 4000	rv, o
Cape Grass Owl	<i>Tyto capensis</i>	?	r?, ?
African Marsh Owl	<i>Asio capensis</i>	?	r?, ?
Long-eared Owl	<i>Asio otus</i>	?	r?, ?
Mackinder's Eagle Owl	<i>Bubo capensis</i>	up to 4200	r, c
Montane Nightjar	<i>Caprimulgus poliocephalus</i>	up to 4200	?, ?
Mottled Swift	<i>Apus aequatorialis</i>	?	r, o
Alpine Swift	<i>Apus melba</i>	up to 4500	r*, c?
Scarce Swift	<i>Schoutedenapus myoptilus</i>	?	r*?, o
Unidentified bee-eater	<i>Merops sp.</i>	4000?	m, r
Eurasian Swallow	<i>Hirunda rustica</i>	up to 4100	m, ro
African Sand Martin	<i>Riparia paludicola</i>	up to 4150	r*, c
Black Roughwing Swallow	<i>Psalidoprocne pristopectera</i>	up to 4100	v, om,
Northern Wheatear	<i>Oenanthe oenanthe</i>	up to 4150	m, ro
Alpine (Hill) Chat	<i>Cercomela sordida</i>	2000–4570	r*, a
Cinnamon Bracken Warbler	<i>Bradypterus cinnamomeus</i>	up to 3850	v?, o
Willow Warbler	<i>Phylloscopus trochilus</i>	4000?	m, r
Hunter's Cisticola	<i>Cisticola hunteri</i>	2600–4200	r*, a
Red-throated Pipit	<i>Anthus cervinus</i>	up to 4180	m, r
Sharpe's Longclaw	<i>Macronyx sharpei</i>	up to 3950	?, ?
Slender-billed			
Chestnut-winged Starling	<i>Onychognathus tenuirostris</i>	up to 4250	v & r*, o-c
Scarlet-tufted Malachite Sunbird	<i>Nectarinia johnstoni</i>	3450–4300	r*, a
Tacazze Sunbird	<i>Nectarinia tacazze</i>	up to 4000	r?, co
Yellow-crowned Canary	<i>Serinus canicollis</i>	up to 4700	v, r-c
Streaky Seed-eater	<i>Serinus striolatus</i>	2750–4200	r*, a
White-naped Raven	<i>Corvus albicollis</i>	up to 4180	v, r
<b>Mammals (43 spp)</b>			
African Dormouse	<i>Graphiurus murinus</i>	up to 4180	r, c
Striped Tree Mouse	<i>Dendromus insignis</i>	up to 4330	r, a



Table 1. *continued* Alpine vertebrates of Mount Kenya.

SPECIES	Latin Name	Altitude (m)	Status
Harsh-furred Mouse	<i>Lophuromys flavopunctatus</i>	up to 4100	r, ?
Striped Grass Mouse	<i>Lemniscomys striolatus</i>	up to 4300	r?, ?
Four-striped Grass Mouse	<i>Rhabdymus pumilo</i>	up to 3800	r, ?
Climbing Mouse	<i>Praomys (Hylomyscus) denniae</i>	?	r, a
Mount Kenya Mole Rat	<i>Tachyoryctes splendens (rex)</i>	up to 4050	r, c
Groove-toothed Rat	<i>Otomys orestes</i>	up to 4750	r, a
Groove-toothed Rat	<i>Otomys tropicalis</i>	up to 4175	?, ?
Porcupine	<i>Hystrix sp.</i>	up to 3500	?, ?
Hare	<i>Lepus sp.</i>	up to 3350+	?, ?
Bat	<i>(Pipistrellus nanus)?</i>	up to 3000	?, ?
Pygmy Shrew	<i>Crocidura alpina</i>	up to 4180	r, c
Dusky Shrew	<i>Crocidura fumosa</i>	up to 3920	r, ?
Dusky Shrew	<i>Crocidura turba</i>	up to 4100	?, ?
Mole Shrew	<i>Myosorex (Surdisorex) polulus</i>	up to 3920	r, ?
Shrew	<i>Soncus infinitesimus</i>	?	r?, ?
Sykes' Monkey	<i>Cercopithecus mitis</i>	up to 4800	x, r
Black and White Colobus	<i>Colobus polykomos</i>	up to 4700	x, r
Hunting Dog	<i>Lycaon pictus</i>	up to 4250	v(r), r
Black-backed Jackel	<i>Canis mesomelas</i>	up to 3660	?, ?
Zorilla	<i>Ictonyx striatus</i>	up to 4270	r, o
Large-spotted Genet	<i>Genetta tigrina</i>	?	?, ?
Marsh Mongoose	<i>Herpestes paludinosus</i>	up to 3500	?, ?
Slender Mongoose	<i>Herpestes sanguineus</i>	?	?, ?
Spotted Hyaena	<i>Crocuta crocuta</i>	up to 4800	v, o
Cheetah	<i>Acinonyx jubatus</i>	up to 4000+	v, r
Serval	<i>Felis serval</i>	?	?, ?
Wild Cat	<i>Felis lybica</i>	up to 3800	r, c
Lion	<i>Panthera leo</i>	up to 3600	v(r?), o
Leopard	<i>Panthera pardus</i>	up to 4600	r*, c
Rock Hyrax	<i>Procavia johnstoni</i>	3450–4700	r*, a
African Elephant	<i>Loxodonta africana</i>	up to 4600	v, o
Black Rhinoceros	<i>Diceros bicornis</i>	up to 3700	r, e?
Burchell's Zebra	<i>Equus burchelli</i>	up to 4300	r*, c
Kongoni	<i>Alcephalus buselaphus</i>	up to 4000	r?, o
Black-fronted Duiker	<i>Cephalophus nigrifrons</i>	?	?, ?
Bush Duiker	<i>Silvicapra grimmia</i>	3250–4300 (–4900)	r, c
Klipspringer	<i>Oreotragus oreotragus</i>	?	?, ?
Steinbuck	<i>Raphicerus campestris</i>	up to 3500	r, o
Bongo	<i>Boocercus eurycerus</i>	up to 4300	x, r
Eland	<i>Taurotragus oryx</i>	up to 3800	r*, c
African Buffalo	<i>Syncerus caffer</i>	up to 4700	v, c